

**JUNE 2002**

**INTERNATIONAL GCSE**

**MARK SCHEME**

**MAXIMUM MARK : 70**

**SYLLABUS/COMPONENT : 0610/3**

**BIOLOGY  
(EXTENDED)**

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- Q1 (a) ANY TWO FROM:  
 pond snails feed on or gain nutrients from + Elodea AW /  
 (Elodea) provides + camouflage / a hiding place (from predators) AW /  
 (Elodea) produces oxygen for snails /  
 Snails lay eggs on Elodea /  
 (Elodea) provides shade for snails ; ;  
 (R) refs to habitat 2

- (b)(i) (TUBE 1)  
 Elodea is photosynthesising ;  
 so CO<sub>2</sub> is removed from the water / CO<sub>2</sub> drops / CO<sub>2</sub> low ;  
 (TUBE 2)  
 pond snails are respiring ;  
 producing CO<sub>2</sub> / CO<sub>2</sub> increases / CO<sub>2</sub> high ;  
 (TUBE 3)  
photosynthesis by Elodea equals respiration by snails AW ;  
 so there is no net change in CO<sub>2</sub> / ref. to balance of CO<sub>2</sub> ;  
 (TUBE 4)  
 snails are respiring more than Elodea is photosynthesising AW ;  
 so there is a net production of CO<sub>2</sub> / CO<sub>2</sub> increases / CO<sub>2</sub> high ;  
 (TUBE 5)  
 Elodea has no light for photosynthesis ;  
 but it is still respiring / respiration only ;  
 CO<sub>2</sub> produced / CO<sub>2</sub> increases / CO<sub>2</sub> high ; max. 10

- (ii) ref. to control ;  
 to show that pH / indicator colour + does not change in response  
 to light / with time / other factors OR indicator only changes in response  
 to living organisms / life processes AW ; 2

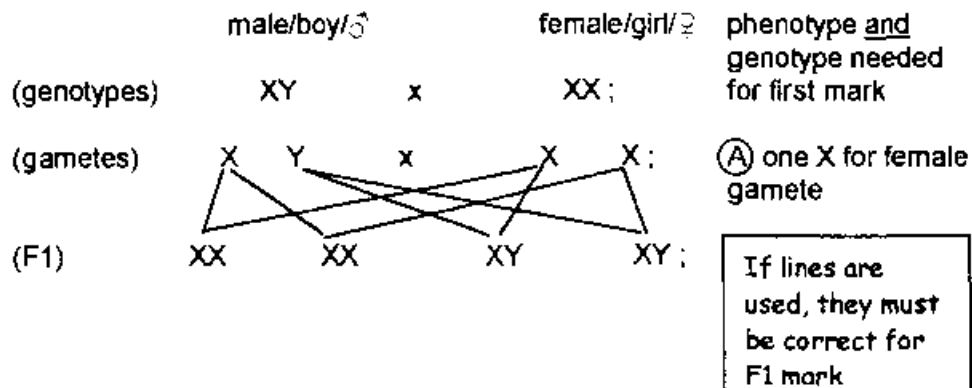
max.14

- Q2 (a) A = nucleus ;  
 B = cytoplasm ;  
 C = membrane / plasmalemma ; 3

- (b)(i) haploid ; 1

- (ii) thread / strand / piece / bit AW of + DNA ;  
 made up of (many) genes ; 2

- (c) ACCEPT ANSWER AS PUNNETT SQUARE IF OFFERED



Ratio = 1 (male) : 1 (female) ;

- (A) 50% : 50% (A) equal ratio (A) 2 : 2 4

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- Q3 (a) ACCEPT ANSWERS IN SPACE BELOW TABLE, IF NOT ENTERED IN TABLE
- |                         |            |                    |   |
|-------------------------|------------|--------------------|---|
| (mean length)           | 53.5 (mm); | MARK CONSEQUENTIAL |   |
| (mean change in length) | -6.5 (mm); | ERRORS             |   |
| (% change in length)    | -10.8;     |                    | 3 |
- (b) MAX. 4 IF AXES ARE WRONG WAY ROUND (no mark for ii. or iv.)
- x axis scale suitable and correct ; (A) at base of graph
  - x axis label and units correct ; (A) at base of graph
  - y axis scale correct ;
  - y axis label correct ;
  - points all plotted accurately ;
  - accurate line drawn between points ; (A) line of best fit  
(R) one straight line
- (c)(i) 0.11 mol ; (mark according to the line on the graph) 1
- (ii) ref. to the same concentration / WP + inside the cells as outside AW ;  
so no net movement of water AW ; (A) osmosis does not occur 2
- (d)(i) piece 1 at 0 mol (after 24 hours) ; 1
- (ii) % change in length is lower than it should have been ; 1
- (e) ANY TWO FROM:
- enables absorption of water into root (hairs) /
  - keeps plants upright AW OR prevents wilting when water is available /
  - ref. to control of stomatal openings AW /
  - provides water for + photosynthesis OR enzymes to work in OR other process needing water /
  - enables uptake of water without use of energy AW /
  - ref. to allows mass flow of ions AW /
  - maintains turgidity of cells /
  - to close flowers or leaves (or v.v)
  - ref. to movement of water across cortex AW /
  - ref. to vacuolation of growing plant cells ; ;

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- Q4 (a)(i) loss of water vapour/ evaporation of water + from plant leaves / aerial parts of plant ;  
through stomata / stomatal pores ;  
by diffusion ; 3
- (ii) **ACCEPT OTHER VERSIONS, BUT MAX. 7 IF NOT WORKABLE (small plant)**
- i. Whole plant / plant with roots ref. to roots in soil / plant in pot ;
  - ii. pot / roots + sealed in plastic bag AW ;
  - iii. weigh whole plant ;
  - iv. leave for measured amount of time / viable time stated ; e.g. hrs or days
  - v. ref. to cool conditions + hot conditions ;
  - vi. reweigh ;
  - vii. calculate rate of water loss e.g. g/min ;
  - viii. ref. to how temperature conditions are achieved ;
  - ix. ref. to control of other variable(s) ;
  - x. prediction : plant will lose water faster in hot conditions ;
- (or – **weight potometer**)
- i. set up shoot in container with water ;
  - ii. ref. to sealing water surface with oil AW ;
  - iii. weigh potometer / record volume of water in container ;
  - iv. leave for measured amount of time / viable time stated ; e.g. hrs or days
  - v. ref. to cool conditions + repeat in hot conditions ;
  - vi. reweigh / record new volume of water in container ;
  - vii. calculate rate of water loss e.g. g/min ;
  - viii. ref. to how temperature conditions are achieved ;
  - ix. ref. to control of other variable(s) ;
  - x. prediction : shoot will lose water faster in hot conditions ;
- (or – **bubble potometer**)
- i. attach shoot to + capillary tubing /potometer ;
  - ii. ensure capillary is full of water / no air locks AW ;
  - iii. introduce bubble and note its position ;
  - iv. leave for measured amount of time / viable time stated ; e.g. minutes
  - v. ref. to cool conditions + repeat in hot conditions ;
  - vi. note new position of bubble ;
  - vii. calculate rate of bubble movement ;
  - viii. ref. to how temperature conditions are achieved ;
  - ix. ref. to control of other variable(s) ;
  - x. prediction : plant will lose water faster in hot conditions ; max. 8
- (b)
- i. ref. to shortage of water / windy / low humidity / high temperature / higher concentration of salts in soil than in root ;
  - ii. conditions may result in more water loss than gain ;
  - iii. so cells lose water ;
  - iv. ref. to cells + become flaccid / no longer turgid ;
  - v. so leaf / stem + is no longer rigid AW ; max. 4
- max. 15

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Q5 (a)(i)

- i. ref. to nitrogen-fixing bacteria / action of lightning / ref. to Haber process;
- ii. convert nitrogen to + nitrate / nitrogen compound ; (R) nitrite
- iii. nitrate is absorbed into plant roots ;
- iv. by diffusion / active uptake AW ;
- v. and moves up xylem ;
- vi. nitrate is used to make plant protein ;
- vii. plant is eaten (by herbivore) ;
- viii. (protein is) digested / broken down ;
- ix. ref. to protease or named enzyme ;
- x. amino acids are produced ;
- xi. ref. to transport in bloodstream to muscle ;
- xii. amino acids used to make muscle protein ;

max. 9

(ii)

- MARK FIRST THREE OFFERED FROM:
- cell membrane / haemoglobin / enzymes / chromosomes /
  - making new cells or organelles or growth or repair of tissues /
  - making collagen or skin or bones /
  - ref. to hair or keratin or nails / antibodies / hormones / fibrinogen /
  - alternative energy source ; ; ;

3

(b)

- magnesium is needed for making chlorophyll ;
- chlorophyll traps light AW ;
- to enable + production of food for the plant / photosynthesis ;
- ref. to chlorosis / yellowing of leaves AW ;

max. 3

max.15

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- Q6 (a)
- (i) **(NATURAL)**
- i. rhythm method / calendar method ;
  - ii. ref. to need to know pattern of menstrual cycle AW ;
  - iii. no intercourse + when egg is in oviduct / for identified days ;
  - iv. ref. to rise in body temperature as indicator ;
- OR:**
- i. ref. to withdrawal method ;
  - ii. ref. to prior to ejaculation ;
  - iii. ref. to prevents sperm + coming into contact with egg / fertilizing egg / entering vagina ; (R) enter body unqualified
- OR:**
- i. abstinence from sex AW ;
  - ii. so no sperm to + come into contact with egg / fertilise egg / enter vagina ;
- max. 3
- (ii) **(CHEMICAL) - mark for pill or morning after pill or spermicidal cream - MARK FIRST OFFERED**
- v. (contraceptive) pill ;
  - vi. ref. to contains + oestrogen / progesterone ;
  - vii. prevents ovulation ;
- OR**
- v. morning-after pill ;
  - vi. ref. to contains hormones ;
  - vii. prevents fertilised egg from implanting in uterus ;
- OR**
- v. spermicidal cream ;
  - vi. ref. to application in vagina ;
  - vii. kills sperm ;
- 3
- (iii) **(MECHANICAL) - mark for condom or cap or IUD**
- viii. ref. to condom / cap ;
  - ix. ref. to prevents sperm coming into contact with egg / fertilise egg / enter vagina ;
  - x. ref. to method of application ;
- OR**
- viii. ref. to IUD ;
  - ix. ref. to method of application ;
  - x. prevents fertilised egg from implanting in uterus ;
- 3
- (iv) **(SURGICAL)**
- xi. ref. to sterilization / vasectomy / laparotomy ;
  - xii. ref. to oviducts / sperm ducts + cut and sealed or tied ; (A) tied unqual.
  - xiii. so no eggs / sperms + can pass through ;
- 3
- (b)
- i. bacteria reproduce asexually ;
  - ii. by binary fission ;
  - iii. description of process ; (A) ref. to mitosis ;
- 3  
max.15

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Q7 (a) MARK FIRST FOUR COMPARISONS MADE

- |       |   |  |
|-------|---|--|
| i.    | table with suitable headings ;<br>(arteries)      | (veins)  |
| ii.   | carry blood from heart                            | carry blood to heart ;                                 |
| iii.  | carry oxygenated blood<br>except pulmonary artery | carry deoxygenated blood<br>except pulmonary vein ;    |
| iv.   | thick (muscle) wall                               | thin (muscle) wall ;                                   |
| v.    | thick layer of elastic (fibres)                   | thin layer of elastic fibres ;                         |
| vi.   | narrower lumen                                    | wider lumen ;  |
| vii.  | no valves   | valves present ;                                       |
| viii. | carry blood at high pressure /<br>blood in pulses | carry blood at low pressure /<br>blood not in pulses ; |

max. 5

(b)

- i. ref. to glucose / amino acids / oxygen / other named suitable material ;
- ii. walls are 1 cell thick ; (A) thin walls (R) capillaries are one cell thick
- iii. ref. to wall being permeable AW ;
- iv. lumen is small / capillaries are narrow ;
- v. so flow rate is slow ;
- vi. ref. to dense network or large + number / surface area ;
- vii. ref. to diffusion ;
- viii. ref. to high pressure in capillaries ;

max. 4

(c)

(i) DIAGRAMS MUST BE ANNOTATED

- i. blood from body / ref. to vena cava ;
- ii. ref. to right side of heart / right atrium + right ventricle (in correct order) ;
- iii. ref. to pulmonary artery ;
- iv. blood from lungs / ref. to pulmonary vein ;
- v. ref. to left side of heart / left atrium and left ventricle + (in correct order) ;
- vi. blood to body / ref. to aorta ;

max. 4

(ii)

- i. blood pressure maintained ;
- ii. oxygenated blood kept separate from deoxygenated blood ;
- iii. enables lower pressure in pulmonary circulation (or v.v) ;

max. 2

.....  
max.15  
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